State of California
Strategic Plan for
Information Technology

Framework For The Future

DEPARTMENT OF INFORMATION TECHNOLOGY

Contents

Executive Summary

If together we succeed in making all the changes that our state needs, then in 30 years California will be what it can be – a towering, incandescent beacon of opportunity that burns boldly, brightly, long after every one of us has turned off the lights, closed the door, and left this grand old building.

Governor Pete Wilson

The State of California is poised to assume a leadership role in integrating government and technology. Technology will enable us to expand government services and improve the quality of life while streamlining procedures, decreasing costs, and replacing paper with electronic means wherever practical. Well-designed technology can benefit every aspect of our daily interactions. The potential of electronic access to information, 24-hour consumer transactions with government, and a dynamic, geographically-independent education system excites the imagination.

However, this opportunity comes with risk. Large information technology (IT) projects are notoriously hard to manage. It is difficult to cite multi-year, multi-million dollar projects within or outside California, public sector or private sector, that have been completed on time and within budget, and that have met initial expectations.

The State's citizens deserve and increasingly demand intelligent, well coordinated and properly managed IT development efforts.

The State also cannot afford to splinter resources on duplicate systems or questionable projects. The state's IT investment must be guided by this basic vision:

One state, one IT infrastructure. The state must have at the least cost to the taxpayer a robust infrastructure, usable by many, with the flexibility to accommodate specialized requirements and projects.

This strategic plan presents five core strategies to realize this vision. These strategies, and the initiatives that support them, create a framework for technology efforts within the state. This is the first step in forging an infrastructure to bring government services closer to citizens and businesses.

California's core strategies are:

Coordinated IT Planning — *Creates a structure for IT project planning, procurement and oversight including:*

- A governance structure at the state, agency, board and department level that promotes coordinated, strategic IT investment at every step of the planning process.
- Procurement reform that eliminates redundant processes and promotes comprehensive contracts that hold vendors accountable.
- Ongoing oversight to ensure that projects follow proven development methodologies and stay within their budget and timelines.
- Consistent project management practices, training, and oversight.

Infrastructure Reengineering — *Provides direction for statewide network and data center coordination, including:*

- Continued privatization of the state's data communication networks to provide an efficient, robust network as outlined in the California Integrated Information Network (CIIN) strategic plan for telecommunications.
- Phased implementation of the recommendations from the Data Center Consolidation Study (DCCS).
- Planning and implementing disaster recovery and business continuity analyses.

Statewide IT Initiatives — *Sets direction for enterprise applications, including:*

- Resolution of ongoing Year 2000 challenges.
- A coordinated approach to enterprise administration systems for tracking, controlling and management of the business operations of the state.
- Standards that support interoperability and the ability to share data while minimizing the total cost of ownership of IT systems and resources.

Strategic Initiatives — *Sets priorities to bring government to the citizen, with the philosophy of on-line as opposed to in-line, including:*

- Electronic commerce as a supplement to traditional government service delivery and transactions.
- Public access to government information.
- Security of confidential information and electronic transactions.

Emerging Issues — *Discusses solutions for upcoming issues that affect IT operations, including:*

- Partnerships with the private sector to enhance revenue and reduce costs through strategic use of IT.
- Innovative methods to recruit and retain IT staff.

This Strategic Plan acknowledges the magnitude of the state's IT investment and the challenge of integrating these assets into a consistent, efficient and accessible framework. Fiscal responsibility for every participating agency must go hand-in-hand with the strategies and initiatives presented here. We must aspire to a state that not only develops effective technology, but that is accountable to its citizenry for the taxpayer dollars it spends. Every project must be evaluated for its ability to further the state's strategic goals as well as its effective spending of state resources.

Effective planning and a strong commitment toward participation by every agency and department can make this plan a true **framework for the future.**

Introduction

California is the home to one in eight Americans. It has a gross state product of almost a trillion dollars. It is the seventh largest economy in the world. It's larger than the economy of all the smaller European countries. California generates 25 percent of U.S. electronics exports. Thirty percent of all Internet messages either begins or ends in California. There are 1.8 million children on AFDC in California. And Medi-Cal serves five million people at a cost of over $10 billion a year. Our public schools serve 5.3 million children, and our higher education system serves 1.8 million students. California's pension program is worth over $100 billion. California owns the third-largest phone system in the state.

John Thomas Flynn
California's Chief Information Officer, 1996

California is a unique state. In size and diversity it exceeds all but six nations in the world. At the state level, there are more than 120 organizations, each with its own agendas, systems and IT projects. Without a central vision, California's organizations are placed in the position of creating costly and redundant applications on incompatible systems.

The Department of Information Technology's (DOIT) task is to coordinate the state government's IT and telecommunications systems and to ensure that the state receives the maximum benefit from its nearly $2 billion annual investment in these technologies. The DOIT is structured into four functional areas: planning and project initiation, oversight, networks and telecommunications, and special projects.

The state's Chief Information Officer (CIO), who oversees the DOIT, reports directly to California's Governor and has final authority to approve, suspend or halt an IT project. The state CIO also has the authority to:

- Review proposed IT projects for consistency with statewide strategies and suspend or not approve a project.
- Recommend remedial measures for agency IT projects, including the use of independent oversight.
- Develop policies and requirements needed to implement SB 1 in the State Administrative Manual (SAM) or by Management Memo.

The state CIO and the DOIT are responsible for developing statewide strategies and plans for investing in and operating California's IT resources. The purpose of statewide guidance is to reduce the cost of government, enhance services to Californians, lower the cost and risk to California's taxpayers, and make government more accessible to the public.

This strategic plan, authored by the state CIO and the DOIT, lays the groundwork for comprehensive coordination, planning and oversight. It provides a vision of the state's IT direction for the next several years and sets a broad policy framework, with specific strategies and actions to help the state move from the current environment to where it needs to be in the future. It also provides a road map for how the state will meet the emerging issues of the next century.

This plan can enable California state government's disparate organizations to move together towards a common goal. Collaboration and partnership are essential to increase the efficiency and effectiveness of the state's business operations, which must be the ultimate goal of any government strategic plan.

A Technology-Enabled Vision Of The Future

The current environment for information technology development and implementation is full of opportunity. Information and telecommunications technology are advancing at a lightning pace, creating ways for businesses and government organizations not just to improve efficiency or lower costs, but to redesign products and services, improve customer service, reengineer business processes, and transform the way people work and live.

Task Force on Government Technology Policy and Procurement, 1994

The information superhighway is about the global movement of weightless bits at the speed of light.

Being Digital, Nicholas Negroponte, 1996

As technology moves beyond the information age to the age of digitally available data and services, a vision of a richer and healthier environment for Californians stretches before us. In a technology-enabled future:

- Health care will be focused on wellness and prevention through readily available health information and resources.

- Education will provide new, geographically independent opportunities for critical thinking and innovation. The best schools, teachers and courses will be available to students at all levels, without regard to geography, resources or disabilities.

- Regional communities or consortiums comprised of private and public collaborative interests will be commonplace and will provide services and information to all Californians, regardless of economic status.

- Individuals, groups, and agencies will communicate with one another in a paperless environment, primarily via electronic messaging. Teachers will communicate electronically with parents, students with teachers, government with citizens, and business with government.

- Individuals will have access to public information, with appropriate electronic security and privacy measures in place, from a variety of locations — schools, libraries, government offices and colleges — to make informed decisions about where to live, work, get health care and go to school.

- More and more individuals will have the option to telecommute to their jobs. Individuals will either work from their homes or from telework centers located near major metropolitan centers. Rush hour traffic will decrease as a result of more options in how and where Californians work.

- Video and audio conferencing will provide a common format for meetings. Attendees will no longer need to travel to central meeting sites.

- California businesses and companies will experience exceptional growth due to the increased demand for California products (telecommunications, bio-medical technologies, entertainment, multimedia, high-tech products and services) and the availability of a highly skilled California workforce.

- California businesses, regardless of size, will compete in the global economy through a suite of electronic commerce tools, including high performance transaction processing on the World Wide Web, electronic messaging, digital signatures, and electronic certification and authentication.

- California will be a constellation of regional economies focused on producing globally renowned California products.

- State, local and federal government services will be available on-line. Services will be available when and where businesses and individuals need them.

- Massive mailings to California businesses and citizens of government forms, such as tax returns, recertifications, and vehicle registrations, will be supplemented by electronic delivery and electronic response and payment.

- Government benefits will be deposited directly into individuals' and businesses' bank accounts, replacing checks.

- Individuals with special needs will have access to the full range of on-line information and services through the use of assistive devices and adaptable interfaces.

Building the infrastructure and applications to support this environment is California's challenge, now and for the future. The state needs to provide the strategic planning and coordination at all levels to overcome the challenges in transforming the current IT environment. The following is an overview of California's current IT environment:

- Within the three branches of state government, more than 120 agencies and departments divide an annual IT budget of up to $2 billion and a support staff of more than 5,800 individuals.

- Though the DOIT now requires monthly reporting of major project IT costs, where previously departments reported only on an annual, non-project-specific basis, there is no enterprise accounting system to provide independent, reliable and accurate IT cost data.

- The state has a voice telecommunication system that has an annual budget of over $30 million.

- The Health and Welfare Data Center (HWDC) and Teale Data Center (TDC) provide approximately 70 percent of the state's data processing. Several state departments operate their own data processing centers.

- State agencies and departments use multiple hardware platforms ranging from PCs to mainframes with a multitude of operating systems on a variety of desktop devices connected through a number of network protocols.

- Departmental IT budgets are prepared independently, without consistent enterprise-level coordination.

This strategic plan has been developed to provide guidance to the state in moving from this current environment to one that promotes the applications and network infrastructure required to support the vision of a better future.

The vision expressed in the executive summary, and the strategies and initiatives that follow, address these issues. By presenting orderly, measurable steps to meet this challenge, the DOIT proposes to build a framework for the future of California.

Coordinated IT Planning

Coordinated IT planning is of primary importance to the deployment of the state's IT investment in a way that supports California's IT vision. In the past, independent agency and department activities have resulted in a collection of fragmented IT systems and applications. While many of these efforts have provided successful business solutions for their particular environments, as a whole they have not optimized the state's IT investment, nor have they formed a framework to provide effective solutions for the future that will fundamentally improve the operation of the government enterprise. Coordinated IT planning efforts must occur at the state level, and within and among agencies and departments in California.

The first step in addressing this issue is to create policies, procedures, and a governance structure that supports coordinated planning and ensures both the relevance of new efforts to strategic goals and their successful development.

Strategy #1 — The State of California will develop and enforce a governance structure that ensures the relevance and success of the state's IT efforts.

The state will focus on four initiatives to achieve and support Strategy #1. These initiatives are arranged in sequential order.

Initiative1a —*Establish and empower CIOs at the agency and department levels.*

Initiative1b — *Require departmental IT strategic plans that support both the state strategic plan and the business strategic plan at the agency and department levels.*

Initiative1c — *Streamline and enforce project initiation, approval and oversight policies to ensure success of state IT projects.*

Initiative1d — *Establish a consistent approach to project management practices and training.*

Initiative1e — *Continue with DGS to implement IT procurement reform initiatives as well as coordinate statewide IT training and professional development.*

Initiative 1a — **Establish CIOs at the agency and department levels.**

To achieve coordinated IT planning, the state must have individuals in charge of this function within each agency and department and who are empowered with the authority to successfully accomplish the tasks before them. The structure for coordinated planning starts with the state CIO, supported by agency CIOs, department CIOs, and by private sector industry experts.

State law mandates two IT advisory bodies:

- California Information Technology Commission (CITC), composed of industry experts;
- The Information Technology Coordinating Council (ITCC), composed of agency and select department CIOs;

To advise the state CIO in forming and executing a consistent IT policy for the state.

The agency CIO, supported by department CIOs, will be responsible for ensuring that each department has a strategic technology plan that supports its business plan and the state's IT strategic plan. In addition, the department CIOs must coordinate proposed efforts and departmental IT operations to maximize the effective use of state resources and eliminate unnecessary or redundant efforts and activities.

Explicitly established roles and responsibilities for each level of state government is essential for coordinating California's IT investment.

To accomplish Initiative 1a, the State of California will perform the following actions:

Action #1 — The DOIT will publish agency and department CIO roles and responsibilities by July 1998

Action #2 — All agencies and departments will designate their CIOs by January 1999.

Initiative 1b — **Require departmental IT strategic plans that support both the state strategic plan and the business strategic plan at the agency and department levels.**

A system of IT strategic planning that fits within the framework of the state's IT strategic plan, vision and enterprise directions must be developed and put in place to effectively plan and coordinate the state's IT investments. This system of strategic planning must encompass the three tiers of state government.

The agency plan is not a traditional IT strategic plan, but rather an overview of how the agency will coordinate and direct its constituent departments' efforts and plans. The agency plan should describe the governance model that the agency will use to guide its departments IT investments and

support the state's IT Strategic Plan.

Department-level strategic plans must complement the agency strategic plan. It will be necessary for each department to do the following:

- Assess its current IT activities, operations and investments to determine the extent of alignment with its business strategic plans.

- Develop strategies to bring its current IT activities, operations and investments in line with its business strategic plans, the state's IT strategic plan and the overall directions of state IT operations and investments.

- Initiate projects or efforts aligned with the overall directions presented in the business strategic plans and in the state's IT strategic plan.

California can ensure that the state's overall IT investment and operations are consistent and efficient by supporting both business and IT strategic plans. All projects and activities will support the overarching business needs of the state and the fundamental requirements of California's individuals and businesses.

To accomplish Initiative 1b, the State of California will perform the following actions:

Action #1 — The DOIT will publish the state's IT strategic planning policy and guidelines by the end of FY1997/98.

Action #2 — All agencies and departments will complete an IT strategic plan by January 1999.

Initiative 1c — **Streamline and Enforce project initiation, approval and oversight policies to ensure success of state IT projects.**

The DOIT's role in project initiation and approval is to review departments' project proposals to determine that the projects are necessary, are in compliance with the state's agencies, board's and department's strategic business and IT plans, and have a high probability of success. The DOIT will verify that projects:

- Support core mission functions defined in agency business plans that need to be performed by state government, and are being undertaken by the requesting agency because no alternative private sector or governmental source can efficiently support the function.

- Are consistent with state, agency, and department IT plans and architectures, and are consistent with the department's Year 2000 compliance plan.

- Support business functions which have been optimized and redesigned to be more efficient, to improve effectiveness and to make maximum use of commercial, off-the-shelf software.

- Demonstrate a clear return on investment, including improved mission performance, reduced cost or enhanced revenues, increased quality, speed or flexibility, or improved customer or employee satisfaction.

- Possess the direct and documented support and active sponsorship of the most senior department program executive.

- Are conducted by a project team which is organized around a project manager with appropriate certification and previous management experience in a project of similar size and complexity, are augmented by an independent verification and validation consultant, and include substantial involvement and approval throughout the project from the program officials and staff who will use the system.

- Are structured and established with clear project management and control methodologies for tracking project progress with distinct assignments and accountability for unique, brief, measurable tasks.

- Employ an iterative and open acquisition strategy (alternative procurement) with potential vendors that is performance-based and appropriately reallocates risk from the state to vendors.

Once a project is under way, the DOIT's responsibilities include ensuring that one of the following occurs:

- The project is completed as proposed.

- The project is modified in a controlled manner to meet the original project objectives without adding unacceptable cost or risk.

- The project is terminated in a manner that minimizes cost and adverse impact if it appears unlikely to achieve state objectives.

After a project is completed, the DOIT is responsible for assessing the project's success in meeting its stated objectives within budget and on schedule.

Finally, the DOIT is responsible for streamling and enforcing its project review, approval and oversight activities as necessary to ensure the success of future projects, while minimizing the cost and effort of initiating, managing and overseeing them.

To accomplish Initiative 1c, the State of California will perform the following actions:

Action #1 — The DOIT will issue a report to the Legislature detailing the proposed changes to the state's project initiation and approval process by the end of 1997.

Action #2 — The DOIT has issued revised state IT policies for project initiation and approval by the end of FY 1997/98, and will issue policies for oversight by July 1998.

Initiative 1d — **Establish a consistent approach to project management practices and training.**

California has experienced both IT successes and failures. The reason most often cited for a project's failure is the lack of a consistent approach to managing state IT projects. For an automation project to be successful, a number of different tools and techniques must be employed throughout the project life cycle. These include:

- Project management methodology.
- Structured development methodology.
- Project management training.
- Project work plans.
- Workload estimation.
- Quality assurance techniques and independent oversight.
- Contract management.
- Project management structure.

By using these tools and techniques, the state can increase the chance of successfully completing an automation effort on time, within budget and meeting customer needs.

The state will initially provide direction for project management methodology, structured development methodology and project management training.

To accomplish Initiative 1d, the State of California will do the following:

Action #1 — The DOIT will publish statewide policies outlining project management training requirements by July 1998.

Action #2 — The DOIT, with involvement from state agencies and advisory councils, will select a standard project management methodology and develop implementation steps by the end of FY 1998/99.

Action #3 — The DOIT will administer and conclude a research study, with involvement from state agencies and advisory councils, to select a structured development methodology by the end

of FY 1998/99.

Action #4 — The DOIT will publish policies, standards and guidelines to support these methodologies by the end of the first quarter of SFY 1999/00.

Initiative 1e — **Continue to implement state IT procurement reform initiatives.**

Recent IT procurement reform measures promote competition among vendors and cooperative partnerships between the private sector and the state. These include competitively bid, prequalified listings of master service agreement (MSA) approved technology vendors, and innovative IT procurement vehicles such as the California State Computer Store.

These measures have been consistent with recommendations by the Task Force on Government Technology Policy and Procurement.

The intended further changes in the reformed procurement process would:

- Reduce the IT product delivery cycle.
- Shift from cost-based awards to value-based awards for all non-commodity procurements.
- Encourage vendors to propose innovative and creative approaches and solutions to meet business needs rather than simply meeting technical specifications.

In addition, innovations in IT procurement contract language will enable rapid dispute resolution during the implementation of existing contracts. This includes the creation of a project executive committee that would act with the support of the DOIT and the Department of General Services (DGS). This team of project managers, agency IT officers and vendor representatives will resolve disputes and handle the inevitable changes required during the development and implementation of multi-year contracts.

Proposed legislation also addresses the protest process by reforming and simplifying the protest and resolution of contract awards, giving the DGS authority to resolve protests with a fast and fair administrative decision process.

To accomplish the goals of Initiative 1d, the State of California will perform the following actions:

Action #1 — The DOIT will develop and issue "best practices," with involvement from state agencies, the private sector and advisory councils, to improve the acquisition process of IT products and services by September 1998.

Action #2 — Through the on-going project initiation and approval process, the DOIT will work with departments to ensure that they are using alternative procurement methods to address state business needs that emphasize business-based requirements and an iterative process with vendors.

Infrastructure Reengineering

The technology life cycle constantly demands the reevaluation of past decisions and the transition to newer standards and technologies as they evolve. Evolution demands constant reevaluation and adaptation.

Standards Policy for Information Infrastructure, 1995

This section of the Strategic Plan focuses on strategies and initiatives for managing, investing in, and reengineering the state's IT infrastructure efficiently and effectively. As discussed earlier, the state's IT infrastructure investment over the past two decades has to a large degree been a series of fragmented efforts with little state-level guidance or oversight.

For California state government to be optimally successful in the twenty-first century, it must successfully manage and maintain current and future IT assets by reducing redundancy in state-level IT programs and fostering investment in technologies that have the greatest promise for achieving future success. The IT infrastructure need not be a single, monolithic network but rather well-developed blocks of interconnected infrastructure — a combination of innovative projects, existing successful projects, and a reliable network to support these projects.

Strategy #2 — **The state will develop and implement initiatives to provide a robust, interoperable IT infrastructure.**

Under this strategy, the state will continue the implementation of three initiatives. These initiatives are arranged in order of their importance in achieving this goal.

Initiative 2a — *Continue implementation of the state's network consolidation initiatives.*

Initiative 2b — *Implement recommendations from the state's Data Center Consolidation Study.*

Initiative 2c — *Develop and implement policies and procedures to ensure that the state can resume business operations through disaster recovery.*

Initiative 2a — **Continue implementation of the state's network consolidation initiatives.**

Voice and data telecommunications networks have proliferated in the state, along with numerous IT centers. These networks are collectively redundant and unnecessarily expensive, with an annual budget in the hundreds of millions of dollars. The state attempted to consolidate the

communications networks by establishing CALNET within the Department of General Services (DGS) Telecommunications Division, but this state-owned network has not achieved the cost savings, service levels or the consolidation success anticipated.

In December 1996, the DOIT, in partnership with the DGS Telecommunications Division, released a new strategic plan for the state's networks. This report, entitled *California Integrated Information Network Strategic Plan for CALNET and All State Telecommunications Networks*, presented a series of findings regarding CALNET and the state's other telecommunications networks, and outlined a strategy to address the CALNET problems. This included establishing a process to achieve network consolidation. The principal findings include:

- Owning and operating telecommunications networks are neither core competencies nor core responsibilities of the state.

- State-owned network infrastructures have proven costly and cannot keep pace with the rapid developments in telecommunications technology.

- The rapid deployment of new technologies in state agencies requires a common state architecture; the current system of different independent networks hampers the introduction of new technologies.

With these considerations in mind, the state developed a long-term vision for a single architecture for California's telecommunications services and a two-phase plan to achieve that vision. The core of the vision is to establish a common telecommunications infrastructure based on private ownership and operation of the network infrastructure. The implementation will require careful coordination with the data center consolidation initiative to ensure that the vendors providing telecommunications and IT services are effectively managed.

The first implementation phase consists of migrating all state voice traffic to CALNET, adapting frame-relay technology and developing a statewide Master Service Agreement (MSA) for enhanced frame-relay services. The second phase consists of issuing a Request for Proposal (RFP) for the sale of CALNET and all state networks. These may be sold either as a package or individually, depending on which solution represents the best value for California taxpayers. The contract or contracts to provide telecommunication services to California state government will be awarded no later than July 1998.

To accomplish Initiative 2a, the State of California will do the following:

Action #1 — The state will award the RFP for the sale of CALNET, and obtain all state network services by July 1998.

Initiative 2b — **Implement recommendations from the state's Data Center Consolidation Study.**

The state increasingly depends on IT systems to accomplish its work. Every department has at least some programs that cannot function without data processing services. This pervasive need for data processing services has led most departments to develop their own hardware and software assets and professional staff.

The state recognized the need to control this proliferation as early as 1972, when it established consolidated data centers. While this led to some success in centralizing the state's mainframe systems and support structures, even in these traditional services substantial redundancy and overlap of functions remain.

Over the past 15 years, the development of smaller, less complex minicomputer and microcomputer systems has led to fragmented IT throughout state government. This decentralization was inspired by each departments desire to obtain direct control of their critical IT functions, supported by the general industry trend toward distributed data processing.

Many state departments continue to believe that success in their basic missions depends upon their obtaining and managing their own IT resources. However, government and industry must revisit the subject of consolidation first because of the need to control costs and maximize the effectiveness of scarce technical and IT management personnel, and second, to ensure that state departments can share information and technology services. The Governor, the Legislature, and *The Task Force on Government Technology Policy and Procurement* have all conveyed their belief in the importance of consolidation. The *California Competes* report, the enactment of SB 1, and the task force report include the requirement that the DOIT develop a data center consolidation plan.

In late 1996, the DOIT established a project team to study the issues surrounding consolidation of the state's data centers and the state's IT assets. The project team published its final report in July 1997. The report's key recommendations are:

- Consolidate the IBM-compatible mainframe functions that remain outside of the major data centers into the Teale Data Center (TDC). These data centers include those owned and operated by the Franchise Tax Board, State Controller's Office, Public Employees Retirement System, California State Lottery and State Treasurer's Office.

- Convert either the TDC or the Health and Welfare Data Center (HWDC) to a state-owned private corporation dedicated to providing data processing services to California government. This should provide relief from restrictive state personnel policies and salary structures that limit the state's ability to recruit and retain skilled technicians and IT managers.

- Regard the further consolidation of the TDC and HWDC as a long-term option to be considered only after issues of operational recovery preparation and testing, business function support, technical disruption, and Year 2000 problems have been addressed, and only if

financial benefits are identified that would justify the risk and effort of consolidation.

- Consider the full costs of non-mainframe systems, including business continuity and operational recovery, security and systems management, when evaluating new proposals for such systems, and either centralize or distribute as appropriate. Do not centralize existing non-mainframe systems unless dictated by new business requirements for those systems.

- Establish centers of expertise for functions that require specialized technical and management skills, such as imaging, geographic information systems, public access services and specialized operating system environments.

- Resolve all critical Year 2000 problems involving the affected data processing facilities and staff before undertaking any consolidation activity.

To accomplish Initiative 2b, the State of California will do the following:

Action #1 — In FY 1997/98, the DOIT will request the TDC to take immediate steps to acquire a suitable data processing facility.

Action #2 — In FY 1998/99, the DOIT will initiate a study for a plan to convert the TDC to a private, state-owned corporation.

Action #3 — In FY 1999/00, and every two years thereafter, the DOIT will conduct a study comparing HWDC's and TDC's rates to those of private industry.

Action #4 — In FY 2000/01, the DOIT will request that each agency that owns a Tier 2 IBM-compatible mainframe data processing facility develop plans to transfer those functions to the TDC.

Action #5 — Through the DOIT's project initiation and approval process, the DOIT will require that all new non-mainframe systems (excluding those used for local-area network and office automation functions) be located at HWDC or TDC (as appropriate for the existing business alignments of those data centers), unless the departments proposing such new systems present specific business justifications for alternate siting.

Initiative 2c — **Develop and implement policies and procedures to ensure that the state can resume business operations through disaster recovery.**

The ability to successfully implement disaster recovery in 25 key data centers was addressed in the Data Center Consolidation Study, and 52 smaller organizations were studied subsequently. The following conclusions emerged:

- Approximately 53 percent of the agencies are at risk of not recovering their mission-critical systems.

- Nearly 57 percent of the agencies would require more than 14 days to recover their mission-critical systems.

- Seventy percent of the agencies have incomplete plans for data backup and recovery.

- Thirteen percent are probably not recoverable at all due to inadequate data backup and restore measures.

- Two-thirds of the plans reflect a poor-to-fair understanding of their agency's business priorities.

- Only one agency in six is testing its plans and documenting results on a regular basis.

- Only three of the 77 plans include complete, detailed recovery procedures.

In 1996, the DOIT commissioned the development of a documented methodology that state agencies can use to conduct a business impact analysis. This essential first step to any disaster preparation involves identifying mission critical business program functions and the maximum acceptable outage to those functions. This information can then be used to develop, test and maintain operational recovery plans for IT systems that are based on business needs.

To address the significant risk posed by the absence of tested and up-to-date disaster recovery plans, the DOIT will continue to work with departments to develop prudent, viable recovery plans.

To accomplish Initiative 2c, the State of California will do the following:

Action #1 — The DOIT will issue policies in FY 1997/98 requiring departments to include in their Operational Recovery Plans (ORP) a plan for periodic ORP testing, and to identify how they will ensure the viability of any parts of the plan that cannot feasibly be tested. The DOIT will also require departments, as a portion of the required annual update to their ORP, to include the results of the ORP tests performed during the past year.

Action #2 — The DOIT will issue policies in FY 1997/98 requiring departments to identify the Maximum Acceptable Outage (MAO) for any mission-critical business functions supported by IT systems proposed in new Feasibility Study Reports (FSR) submitted to the DOIT. Departments will be required to include in the FSR all provisions, including all one-time and ongoing costs, necessary to ensure that departments will achieve the identified business function MAO.

Action #3 — The DOIT will issue policies in FY 1997/98 requiring departments to determine the MAO for all existing IT-supported mission-critical business functions. In addition, departments will be required to determine the MAO for the supporting IT system to meet the MAO for the business function. The DOIT will require departments to submit plans by the end of FY 2000/01 that show how departments will achieve the identified IT MAO for their mission-critical business functions.

Statewide Initiatives

California is already a world leader in technology. We are a state rich in technical and human resources. California is home to hundreds of existing and emerging technology companies. Our people are products of the best universities in the country; they are highly skilled and trained, working in an environment that tolerates dissent and fosters creativity and innovation. For these reasons, many of the world's leading companies do business in California.

Task Force on Government Technology Policy and Procurement, 1994

The State of California's IT enterprise is equivalent to that of a Fortune 100 corporation. Just as the corporate world strives to leverage its IT investment to provide improved customer service and a high return, so the state is redesigning its enterprise to become a world-class business operation.

Strategy #3 — **The state will provide standards, guidelines, best practices and training to transform its enterprise into an innovative, cohesive business operation.**

Under this strategy, the state will either embark on or continue implementing the following four initiatives, which are arranged in order of their importance:

Initiative 3a — *Continue implementing the California Year 2000 program until all state entities are Year 2000-compliant.*

Initiative 3b — A coordinated approach to enterprise administration systems for tracking, controlling and management of the business operations of the state.

Initiative 3c — *Develop IT standards that support interoperability and the ability to share data, while minimizing the total cost of ownership of IT systems and resources.*

Initiative 3a — **Continue implementing the California Year 2000 program until all state entities are Year 2000 compliant.**

The Year 2000 dilemma goes back to when the expense of disk storage in past decades led computer programmers to express the year using only the last two digits. For example, 10/24/96 is interpreted as October 24, 1996. Computer systems that use this standard assume that the first two digits are 19. As we approach the year 2000, this will cause many programs to fail or miscalculate time-sensitive operations, such as accrued interest, bond payments and bill expirations.

This problem could also affect any system that uses a computer chip. These include automated facilities management systems that control heating, lighting, elevators and building access; cash registers; air traffic control systems; and traffic lights. Every agency and department in California is affected; every computer system and electronic device is vulnerable and will need to be evaluated for Year 2000 compliance. Even computer systems that correctly span the century may be exposed to corruption by data exchanged with systems which are not Year 2000 compliant. This technically daunting, complex and extensive issue presents the largest maintenance challenge the State's IT program has ever faced.

The state government relies on IT in every aspect of its business. Thus, the policy and fiscal implications of Year 2000-related failures are enormous. California's response must be comprehensive, leveraging limited resources and managing and containing risks to the health and safety of its citizens, its public policies, its revenue streams and its reputation. To address these issues, the DOIT initiated the California Year 2000 Program in 1996.

The California Year 2000 Program was designed to increase awareness, evaluate risk, estimate costs and facilitate and monitor resolution of Year 2000 problems for state agencies and departments.

Since this program was initiated, the DOIT has received initial assessment and projections on the Year 2000 problem from every state department. In July 1997, the DOIT published *California's Year 2000 Status-CIO Report*. This report addressed the following:

- Demonstrated that over 500 mission-critical systems will be affected;
- Recognized that over 300 replacement systems are planned;
- Confirmed that continuous monitoring and oversight is crucial to ensure that California will successfully implement all Year 2000 modifications.

The DOIT's Year 2000 Quarterly Report, issued in January 1998, estimated the total state government Year 2000 cost at $243 million (including all fund sources).

The DOIT is responsible for administering a $50 million Year 2000 fund to assist departmental Year 2000 project efforts. In addition, Governor Wilson issued an Executive Order October 3, 1997, stating that Year 2000 solutions shall be each agency's highest priority, and all non-mandated efforts must be deferred until essential systems are Year 2000 compliant.

To accomplish Initiative 3a, the State of California will do the following:

Action #1 — The DOIT will validate departmental requests for year 2000 funding until all departments are Year 2000 compliant.

Action #2 — Departments will report quarterly on the status of their Year 2000 efforts until all departments are Year 2000 compliant. The DOIT will analyze this information and report to the Administration and Legislature.

Initiative 3b — **Establish a coordinated approach to automating shared business operations.**

Prior to the establishment of the DOIT, departments reported their IT costs once per year. Lacking an enterprise level accounting system, the state had no way to track project expenditures against budgets. While this problem has now a temporary, manual-based solution, a long-term policy and direction is necessary. A Fortune Four organization like the State of California should have an administrative system which reflects this status. In addition, as an increasing number of state departments replace antiquated administrative systems, there is a critical need for a comprehensive strategy to ensure that these new systems will provide ready access to the data needed now and in the future, provide a strong foundation for information-sharing and collaboration among departments with similar needs, leverage IT expenditures statewide, reduce redundancy and maximize return on IT investments. The state CIO commissioned the Enterprise Systems Subcommittee of the ITCC to work toward a statewide strategy for developing and implementing enterprise-wide applications for both the state and individual departments.

In September 1997, the enterprise systems subcommittee completed its final report. The following are the highlights of that report:

- The development of a state Enterprise Systems Strategy and new enterprise systems provides an excellent opportunity to foster greater collaboration and information sharing among state departments, leading to enhanced effectiveness and efficiency.

- New enterprise systems need to be flexible and responsive to the needs of the departments they serve, while compatible with other systems. While a single, centralized system was not recommended, the systems must facilitate statewide, automated tracking of budgets and expenditures.

- Existing statewide IT systems and planned projects, such as CALSTARS and the 21st Century Project, should be included in the enterprise systems strategy. As long as they meet the state's needs, these systems and projects should not be replaced or duplicated, and should become the foundation for associated enterprise systems.

- Two or three pilot enterprise systems should be designed and implemented to evaluate alternative approaches to state enterprise systems. These pilots must address statewide enterprise data requirements and, if possible, include one system based on an interagency consortium. They should be implemented and evaluated within 18 months of inception.

- Except for the authorized pilots, a moratorium on developing enterprise systems should be established until the pilots have been implemented, evaluated and determined to be effective models.

- The state's control agencies should establish a standing committee to coordinate their current and anticipated data requirements and to continue to define and coordinate their requirements

over the long term.

- A standing committee of the ITCC should be formed to evaluate pilot systems and to further refine and develop the state's enterprise systems strategy.

- A uniform statewide vendor policy should be developed and enforced to reduce unnecessary and redundant purchases.

To accomplish Initiative 3b, the State of California will do the following:

Action #1 — California's control agencies (including the DOIT, DOF, Department of Personnel Administration, DGS, and State controller's Office) will form a standing committee to coordinate their current and anticipated data requirements by the end of the second quarter of FY 1997/98.

Action #2 — The DOIT will form a standing committee of the ITCC by the end of the third quarter of FY 1997/98 to perform the following:

- Determine the architecture components for the state's enterprise systems.

- Evaluate the enterprise system pilots.

- Evaluate the state's overall enterprise strategy.

Action #3 — Using the criteria established in the enterprise systems subcommittee's final report, the DOIT will review and approve pilot enterprise systems and projects as appropriate in 1997, 1998 and 1999.

Action #4 — As part of its procurement and project initiation and approval reform initiatives, the DOIT will include policy statements that reflect the enterprise systems subcommittee's recommendations for vendor requirements by the end of the third quarter of FY 1997/98.

Initiative 3c **— Develop IT standards that support interoperability and the ability to share data while minimizing total cost of ownership of IT systems and resources.**

One of the key elements of any public IT infrastructure is a Statewide Technical Architecture (STA) supporting the service delivery and business operations of the state. The STA consists of the hardware, software and network components that support the state's business operations. To the extent possible, this architecture should also incorporate the existing IT investment.

By establishing a common STA, the state can meet future needs while realizing economies of scale, interoperability, sharing of technology, improved customer service and technical flexibility.

The STA must allow flexibility for departments to meet their business requirements. It should permit incremental evolution, backward compatibility and modular replacement.

The process of moving towards a common architecture must start with developing a mutually-agreeable conceptual STA model. Policies, standards and guidelines must evolve toward commonality without sacrificing innovation or diverging needs. State-level direction must encourage informed discussion among the stakeholders to develop standards that make sense to all participants.

As confirmed by the recommendations from the Data Center Consolidation Study, the state must define technical standards to support its strategic direction. The STA model should also provide state agencies with information standards, and guidelines for designing and purchasing technology to reduce project start-up times. The success of the STA will be demonstrated by reduced state operation costs, increased automation effort success rates, reduced technical duplication and shorter purchasing cycles, as well as delivery of high performing, fully functional systems to the public.

To accomplish Initiative 3c, the State of California will do the following:

Action #1 — Using a collaborative process with the CITC, the DOIT will develop a plan for the development and maintenance of an STA by July 1998.

Action #2 — With the participation of the ITCC, the DOIT will develop and maintain these standards as a living document and periodically publish updates, guidelines and policies related to them.

Strategic Initiatives

Electronic commerce offers an opportunity for success and prosperity in the twenty-first century economy. California's strong information technology industry is well poised to lead the global electronic commerce transformation. The prosperity of future generations of Californians depends upon the state fulfilling its role of ensuring electronic commerce in California.

P.K. Agarwal, Chief Information Officer California Franchise Tax Board, 1997

Enabling its populace to find information, use services and perform transactions quickly and efficiently is a strategic goal for the State of California. Government agencies are prolific collectors of both confidential and public information. In the past, little of the public information has been readily available to people. Today, electronic communication tools increasingly provide the means for public access to government information and services, while ensuring the protection and security of confidential information. Clearly, this is a direction the state must support to provide improved services and information access directly to its citizens.

Strategy #4 — **The state will sponsor projects to provide secure public access to government services.**

The state will focus on three tenets to achieve and support Strategy #4:

Wherever possible, provide public access to appropriate government information.

Promote electronic commerce as an alternative for delivery of government services and transactions.

Ensure security of confidential information and electronic transactions.

Whenever possible, provide public access to appropriate government information and services.

About two-thirds of California's approximately 120 agencies and departments now have Web sites that provide information about the entity, its services and how to obtain those services. Some of these sites also provide public access to additional government information and electronically delivered services.

Promote electronic commerce as an alternative for delivery of government services and transactions.

To increase the adoption of electronic commerce, the DOIT endorsed the creation of the Electronic Commerce Task Force (ECTF). The ECTF's mission is to promote and accelerate the application and implementation of electronic commerce technologies in California. The ECTF's ultimate goal is to enhance California's competitiveness by building a service infrastructure for the state.

A vital aspect of electronic access is to protect confidential information and on-line transactions. Currently, the state recommends that public access be limited to non-confidential information. This minimizes risk until robust security measures can be developed and deployed. However, some state agencies have indicated that both private citizens and businesses want access to confidential information.

Ensure security of confidential information and electronic transactions.

The DOIT intends to guide state agencies by addressing technical and policy issues and ensuring that the security risks can be controlled to acceptable levels. The DOIT has described its role in the *Improving Public Access to Electronically Stored Government Information Report*. The DOIT's role includes acting in the following capacities:

- Advising the Governor and Legislature on appropriate legislation, regulations and policies.
- Overseeing IT technical and policy issues that should be addressed consistently across state government.
- Encouraging agencies to maximize public access and encouraging the public to exploit the available information.

To accomplish these initiatives, the State of California will perform the following:

Action #1 — The DOIT will publish policies to identify and plan for public access applications for new IT projects by June 1998.

Action #2 — The DOIT, with the cooperation and assistance of the DGS, will ensure that contracts for the private development and maintenance of government information resources include provisions that those resources be made available to the public by the third quarter of FY 1998/99.

Action #3 — The DOIT will publish policies that favor deploying special public access servers rather than providing direct public access to production systems by December 1998.

Action #4 — The DOIT, in coordination with the California State Library, will publish standards for state public access Web sites, including a common central directory, using a consistent set of user interfaces, procedures, and security mechanisms during FY 1998/99.

Action #5 — By the end of the second quarter of FY 1998/99, the DOIT, in collaboration with the ECTF, will publish the statewide policy and direction for electronic commerce.

Emerging Issues

Any strategic plan must be a living document. Over the life of this plan, issues will emerge that need to be addressed. In the preceding chapters, this plan has provided strategies for coordinated IT planning, infrastructure reengineering and statewide and strategic initiatives.

This chapter focuses on emerging issues that require attention today, to provide better government tomorrow.

Strategy #5 — **The State will provide solutions for upcoming issues that affect state government IT operations.**

The state will focus on two initiatives to support this strategy:

Initiative 5a — *Initiate a partnership with the private sector to enhance revenue through the use of IT.*

Initiative 5b — *Develop and implement innovative approaches to recruiting and retaining state IT staff.*

Initiative 5a — **Initiate a partnership with the private sector to enhance revenues through the use of IT.**

Despite successful collection efforts by state agencies and departments, California is owed hundreds of millions of dollars in uncollected funds. The complexity of California law presents numerous challenges to recovering these funds, particularly in the distribution of funds to agencies and vendors.

Other states have responded with programs called Revenue Maximization, or RevMax for short. RevMax programs are partnerships between the state and private sector vendors to recover funds owed to the states.

In a RevMax program, a state agency or department that identifies a significant revenue maximization opportunity enters into a contractual partnership with an outside vendor. The vendor is responsible for consulting with department personnel, developing the IT necessary to assess available

resources, identifying revenue (either retrospective or prospective) previously unavailable to the state and delivering the identified revenue to the state. Vendors work strictly on a contingency basis and are compensated with a percentage of the recaptured revenue. Vendors who do not bring in new revenue receive no fee. Once the contract is completed, the agency or department operates the program to ensure continued collection of those funds. The vendor's system is turned over to the state at the conclusion of the contract.

The DOIT and the DGS have been working to facilitate the revenue maximization process and have established an MSA with pre-qualified vendors. Interested agencies and departments will be free to select any firm listed on the MSA. Agencies and departments can solicit proposals from qualified vendors and select the proposal with the highest value.

Agencies and departments will then work with the DOIT and the DGS to establish a contract with the selected vendor. Contract discussions will include the DOF to ensure that vendor compensation is consistent with federal and state law. Unlike general proposals submitted for qualification to the MSA, these proposals must identify specific funds available, contain a detailed plan to recover those funds, and provide a reliable estimate of expected recoveries.

Initiative 5b — **Develop and implement innovative approaches to recruiting and retaining state IT staff.**

The state needs skilled staff to develop, operate and maintain California's IT enterprise. However, the current state personnel system is not designed to attract personnel in a rapidly evolving IT environment. As confirmed in the recently published *Data Center Consolidation Study*, the state has difficulty attracting, hiring and retaining skilled technical staff because of existing job classifications and salary caps. The study recommended possible conversion of a state data center to a state-owned private corporation as one way to provide greater flexibility in these areas of concern.

The state has already begun using some innovative methods of classifying IT civil service positions. The HWDC has embarked on an Organizational Design Project, a pilot project aimed at restructuring the State's IT civil service personnel classifications. The HWDC program collapses 35 classifications into 20, creates broadband personnel levels and facilitates recruiting and hiring the most qualified candidates through new, more appropriate selection criteria, instead of civil service hiring and promotional lists. If this project proves successful, it can serve as the basis for an even broader, more aggressive statewide reform.

Other opportunities exist for resolving the staff recruitment and retention problem, such as moving temporary staff into permanent positions, leveraging the use of IT in recruiting staff and using recruitment models from private industry.

To implement Initiative 5b, the State of California will perform the following actions:

Action #1 — In FY 1998/99, the DOIT, through collaboration with state agencies and advisory councils, will define and assess the state IT staff recruitment and retention issues and identify

innovative approaches to solving them.

Action #2 — In FY 1999/00, through collaboration with state agencies, the DOIT will sponsor an effort to assess and modify the IT skills and classifications necessary to better support and manage the State's IT enterprise.

Bibliography

1. ***A Framework for Global Electronic Commerce*, National Information Infrastructure Task Force, United States of America, December 11, 1996.**
http://www.iitf.nist.gov/elecomm/glo.comm.htm

2. ***A Handbook for Strategic Planning*, Department of the Navy, Total Quality Leadership Office, United States of America, September, 23 1994.**
http://tql-navy.org/index.html

3. *America in the Age of Information: A Forum*, Committee on Information and Communications, National Science and Technology Council, United States of America, July 1995.
http://www.hpcc.gov/cic/forum/CIC_cover.html

4. *Automating and Managing Internal Operations*, Aberdeen Group, Boston, MA, 1997.
http://www.aberdeen.com

5. *Big, Bad E-mail — These backbone products are designed to be the central switch of an enterprise system*, Turbo, Jan and Snyder, Joel, Network Computing, October 15, 1996 Issue: 716.
http://www.techweb.com/se/directlink.cgi?NWC19961015S0026

6. ***Borders in Cyberspace Information Policy and the Global Information Infrastructure*, Kahn, Brian and Nelson, Charles, MIT Press, Cambridge, 1997.**

7. *Breaking the Barriers to the National Information Infrastructure Ð A Conference Report by the Council on Competitiveness*, Clinton Administration's Information Infrastructure Task Force, United States of America, March 1995.
http://nii.nist.gov/pubs/barriers/cover1.html

8. *British Columbia in 2001 The Electronic Highway and Future of Communities*, Information and Technology Access Office, British Columbia, November 1996.
http://www.itao.gov.ca/bc2001.htm

9. ***Business Case for Data Warehousing Strategies and Technologies*, Butler Group, United Kingdom, October 1996.**
http://www.butlergroup.co.uk

10. *California Strategic Plan for Enhancing Mobility Through the Use of Advanced Information Technology*, International Center for Communications, California State University, San Diego, January 1996.

11. *Chevron Perspectives on Messaging*, Weiler, Marion, Messaging Magazine, January/ February 1997.
http://www.ema.org/html/pubs/mmv3n1/toc.htm

12. *Collaborating to Compete in the New Economy — An Economic Strategy for California*, Trade and Commerce Agency, California Economic Strategy Panel, California, February 1996.
http://commerce.ca.gov/index.html

13. *Commonwealth 2000: A Strategic Plan for Information Technology*, State of Massachusetts, 1995.

14. ***Data Center Consolidation Study Final Report*, Department of Information Technology, State of California, July 1997**.
http://www.doit.ca.gov/

15. *Data Center Consolidation Study Interim Report*, Department of Information Technology, State of California, March 1997.
http://www.doit.ca.gov/

16. *Data Warehousing, An Introduction what's It All About?* Hildebrand, Carol, CIO Magazine, October 1, 1996.
http://www.cio.com

17. *Data Warehousing Gotchas*, Greenfield, Larry, LGI Systems, December 2, 1996.
http://pwp.starnetinc.com/larryg/index.html

18. *Department of Information Technology State of California 1996 Annual Report*, Department of Information Technology, State of California, July 1996.
http://www.doit.ca.gov/

Electronic Commerce in the NII, National Information Infrastructure Cross Industry Working Team, United States of America, October 1995.

20. *Esprit Project 22469 — DWQ Foundations of Data Warehouse Quality*, Vassiliou, Yannis, European Commission on Data Warehousing, Athens, Greece, May 26, 1997.
http://www.dbnet.ece.ntua.gr/~dwq

21. **Getting Results — The Governor's Council on Information Technology, State of California, 1995**.
http://www.ca.gov

22. *Government Services Information Infrastructure Plan Architecture*, DOE, July 1996.
http://www.er.doe.gov/production/octr/mics/gsiitoc.html

23. ***Government-wide Electronic Mail for the Federal Government*, Office of Management and Budget, United States of America, 1993**.
http://www.fed.gov/email.pmo/emtf/emtf.html

24. *Governor Pete Wilson 1997 State of the State Address*, Governor Pete Wilson, State of California, January 1997.
http://www.ca.gov

25. *Governor Pete Wilson Initiatives for a Better California*, Governor Pete Wilson, State of California.
http://www.ca.gov

26. *Governor Pete Wilson's Remarks — Presentation of 1997-1998 State Budget*, Governor Pete Wilson, State of California, January 1997.
http://www.ca.gov

27. ***Governor Pete Wilson's Remarks — Remarks for the Sacramento Rotary Club*, Governor Pete Wilson, State of California, April 11, 1996**.
http://www.ca.gov

28. *Information Engineering: Strategic Systems Development*, Finkelstein, Clive, Addison-Wesley Publishing, Massachusetts, 1992.

29. *Information: Its Architecture and Management Business and the Warehouse*, Jones, Martyn, International Data Warehousing Association, 1997.
http://www.idwa.org/fall96/info.htm

30. *Information Technology: An Important Tool for a More Effective Government*, Legislative Analyst's Office, State of California, June 1994.

31. *Information Technology Architecture for the City of Calgary*, Calgary, Canada, January 1994.
http://www.gov.calgary.ab.ca/04/04itexe.html

32. *Information Technology Strategic Plan for the College of William and Mary*, College of William and Mary, Williamsburg, Virgina, August 1996.

33. *Lockheed Martin's Journey Toward Enterprise Messaging*, Baer, Lindy and Wincor, Steve, Messaging Magazine, January/February 1997.
http://www.ema.org/html/pubs/mmv3n1/toc.htm

34. *Mapping the Future of Information Technology*, Northeast Consulting, October 1994.
http://www.ncri.com/index.html

35. *NAFTA: A Preliminary Assessment of the agreement's Impact on California*, Trade and Commerce Agency, State of California, April 1997.
http://commerce.ca.gov/index.html

36. *NOAA's Strategic Plan: A Vision for the Future*, National Oceanic and Atmospheric Administration, United States of America, July 1993.
http://demo1.eis.noaa.gov/public-affairs/grounders/bk3.html

37. *Open Systems Architecture*, Department of Defense, Open Systems Task Force, United States of America, November 1994.
http://www.acq.osd.mil/osjtk/osarch.txt

38. *Overview of Information Technology Architecture (ITA),* Vaughan, Vance, University of California, Berkeley, April 23, 1996.
http://www.berkeley.edu/

39. *Preparing for the Millennium: Florida's State Strategic Plan for Information Resources Management 1996/1997 -1999/2000*, State of Florida, Fiscal Year 1996/97.

40. ***Practical Steps for Aligning Information Technology with Business Strategies — How to Achieve Competitive Advantage,* Boar, Bernard, John Wiley & Sons, New York, 1994**.

41. *Public Access to the Internet*, Kahin, Brian and Keller, James, MIT Press, Cambridge, 1996.

42. *Smart Strategy For Scaleable Apps — Scalability requires a new way of thinking about application design*, Rudin, Ken, I*nformationweek*, May 26, 1997 Issue: 632.
http://www.techweb.com/se/directlink.cgi?IWK19970526S0001

43. *Standards Policy for Information Infrastructure*, Kahin, Brian and Abbate, Janet, MIT Press, Cambridge 1995.

44. *State Chief Information Officer John Thomas Flynn Speech to Government Technology Conference*, State Chief Information Officer, State of California, May 1996.

45. ***State Chief Information Officer John Thomas Flynn Testimony to California Senate Select Committee on Information Technology in State Government,* State Chief Information Officer, State of California, February 1996**.

46. *State of Indiana Information Technology Architecture*, State of Indiana, February 3, 1995.
http://www.ai.org/dpoc/html/toc.html

47. *State of Maryland Information Technology Master Plan*, State of Maryland, November 17, 1995.

48. *State of Washington, Strategic Information Technology Plan*, State of Washington, January 1993.

49. *Statewide Enterprise Strategic Plan for Information Technology 1996 - 2001*, State of Wisconsin, September 16, 1996.

50. *Strategic Planning*, Battelle Seattle Research Center, Seattle, 1996. http://www.seattle.battele.org/library/publica.html

51. *Strategic Planning*, Organizational Solutions Group, Inc., 1996. http://www.erols.com/osgroup

52. *Strategic Planning Guidelines*, Department of Finance, State of California, September 1996.

53. *Task Force on Government Technology Policy and Procurement, Report to Governor Pete Wilson*, State of California, September 1994.

54. Template for Information Strategic Planning, Information Technology Support Center, Department of Labor, United States of America, December 1995.

55. *Texas Strategic Planning*, State of Texas, January 1995. http://www.lbb.state.tx.us/lbb/members/reports/strat/SP2.htm

56. *The Art of Strategic Planning for Information Technology*, Boar, Bernard, John Wiley & Sons, New York 1993.

57. *The National Information Infrastructure: Agenda for Action*, Clinton Administration, United States of America, September 1993. http://sunsite.unc.edu/nii/NII-Agenda-for-Action.html

58. *The Strategic Challenges of Electronic Commerce*, Miers, Derek and Hutton, Graham, Enix Consulting, United Kingdom.

59. *The Strategic Use of Information Technology*, Sloan Management Review, Oxford University Press, New York 1987.

60. *Towards a New Century — The Information Technology Strategic Plan for Missouri State Government*, State of Missouri, June 1996.

61. *Trends in Messaging in 1997*, Radicati, Sara, *Messaging Magazine*, January/February 1997. http://www.ema.org/html/pubs/mmv3n1/toc.htm

62. *Understanding Data Warehousing Strategically*, Boar, Bernard, NCR Corporation, YEAR?. http://www.tekptnr.com/tpi/tdwi/review/bboar1

63. *Universal Access to E Ð Mail Feasibility and Societal Implications*, Anderson, Robert H., Bikson, Tora K., Law, Sally Ann, and Mitchell, Bridger M., Rand Corporation, 1995. http://www.rand.org/publications

64. *Utah's Information Technology Strategic Plan*, State of Utah, Fiscal Year 1995/96.

65. *What is Strategic Planning?* Support Centers of America, 1994-95. http://www.support.center.org/sca

66. *Whips: Data Warehousing at Stanford Stanford University*, Data Warehousing Project, Stanford University. http://www-db.stanford.edu/warehousing/warehouse.html